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Zapushek et al.

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(54) **PNEUMATIC TOOL LOCK**

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Related U.S. Application Data

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(51) **Int. Cl.**[7] **E05B 73/00**; F16K 35/00

(52) **U.S. Cl.** **70/34**; 70/58; 70/61; 70/178; 70/232; 70/386; 137/383

(58) **Field of Search** 70/34, 58, 61, 70/175–180, 232, 386; 137/382, 380, 383

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(57) **ABSTRACT**

A tool lock, especially useful in preventing theft or unauthorized use of a tool. The tool lock has a housing in which a lock cylinder assembly and locking balls are disposed. The tool lock housing has an opening at one end in which a portion of a tool, such as a pneumatic fitting on a pneumatic tool, may be inserted and secured by the engagement of the locking balls. The tool lock housing may further include a shackle portion which can be used in conjunction with a cable, either integral or separate, padlock, or chain to secure the tool lock to another object.

11 Claims, 6 Drawing Sheets

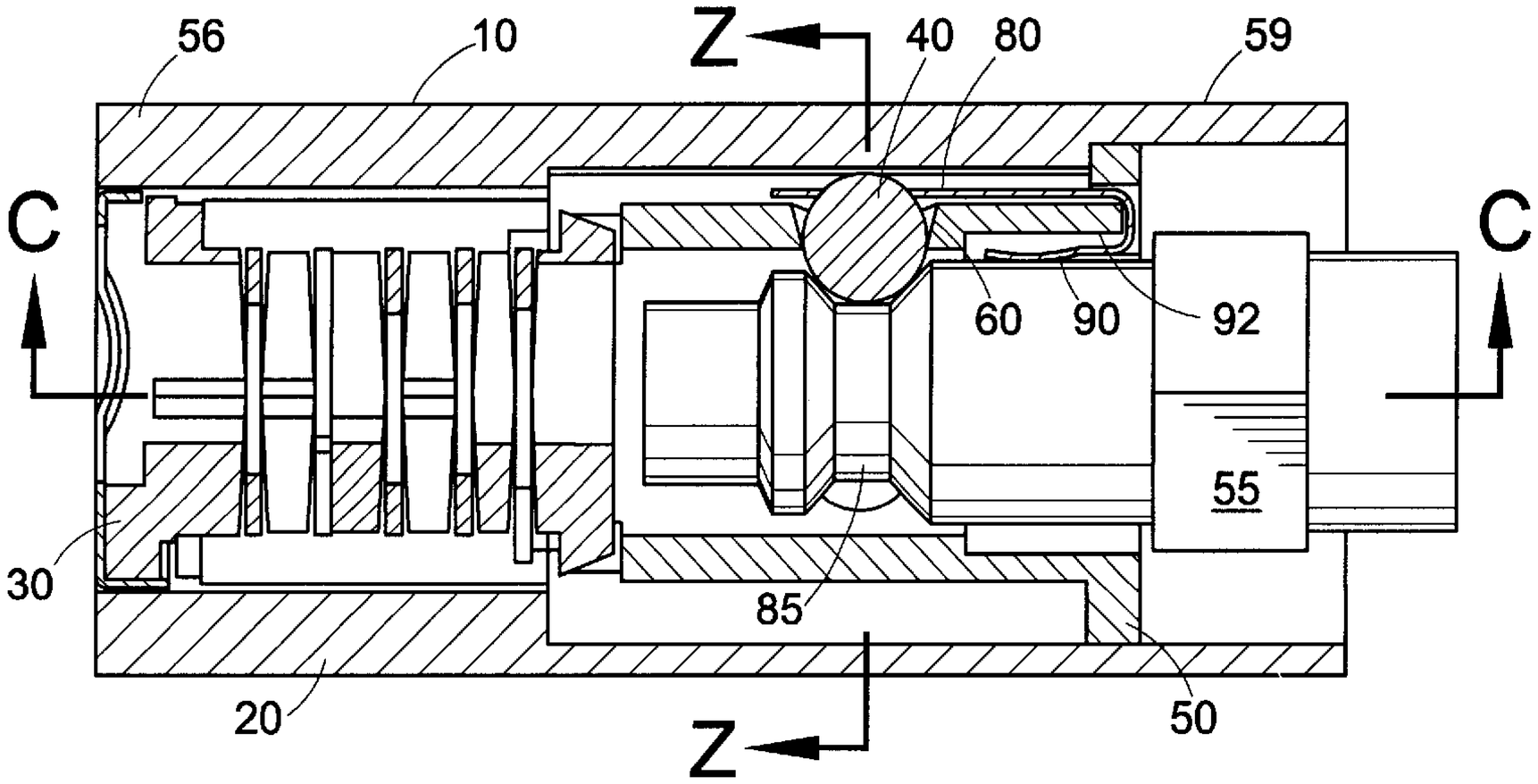


FIG. 1

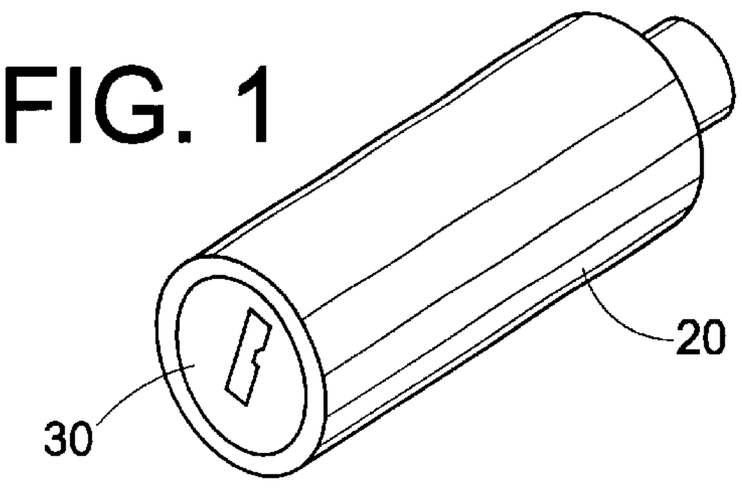
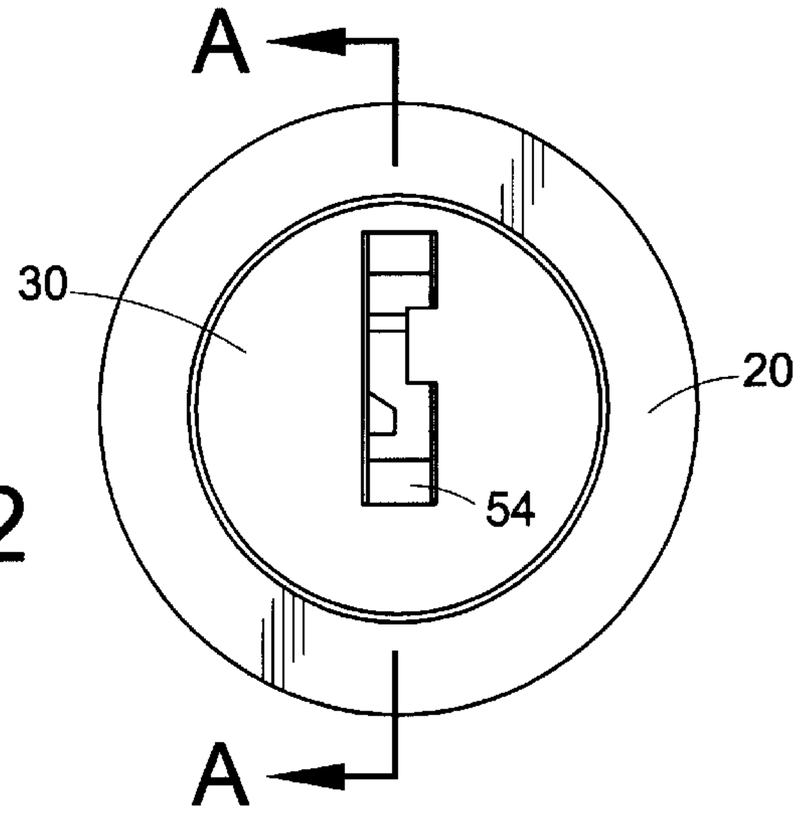


FIG. 2



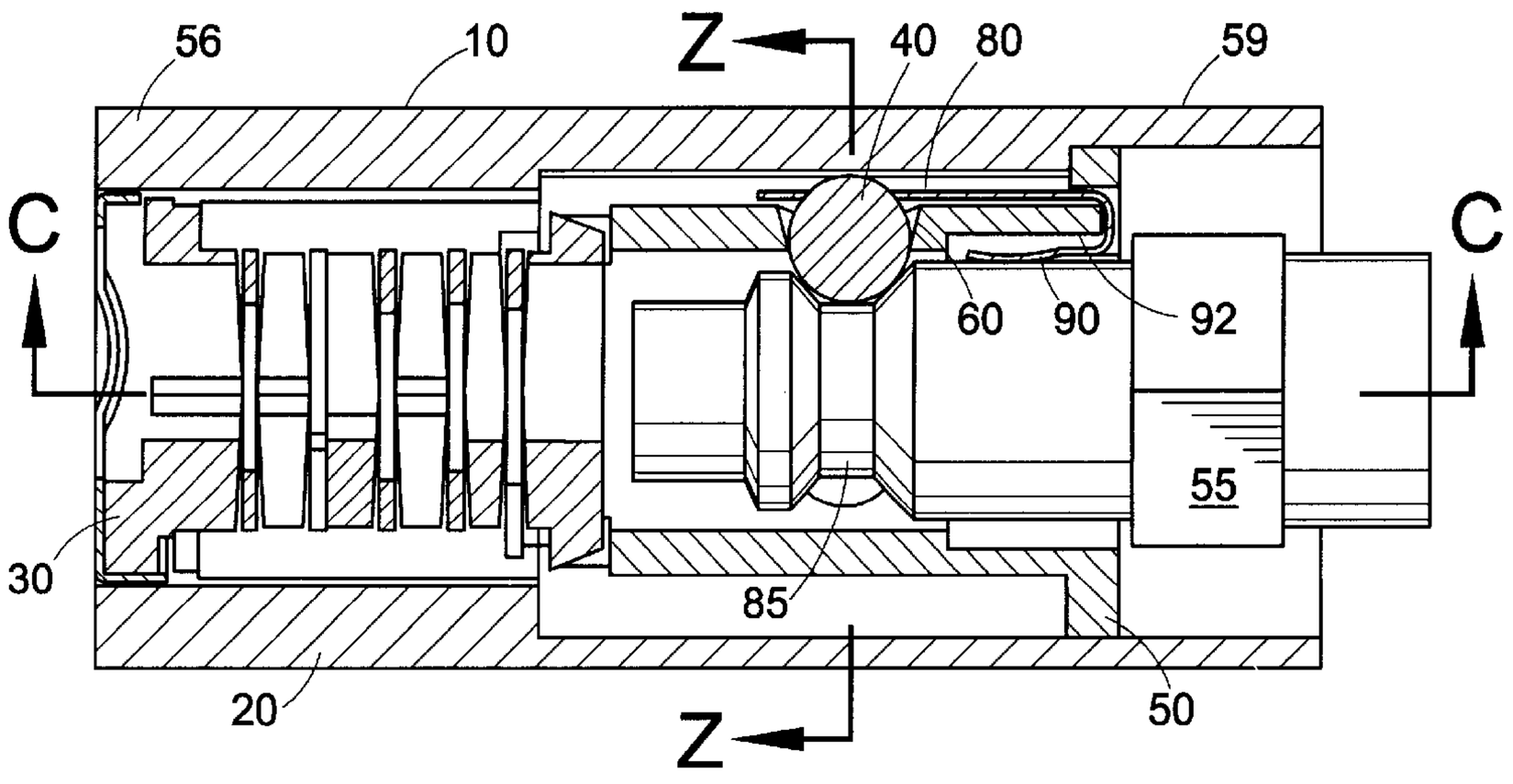


FIG. 3

FIG. 4

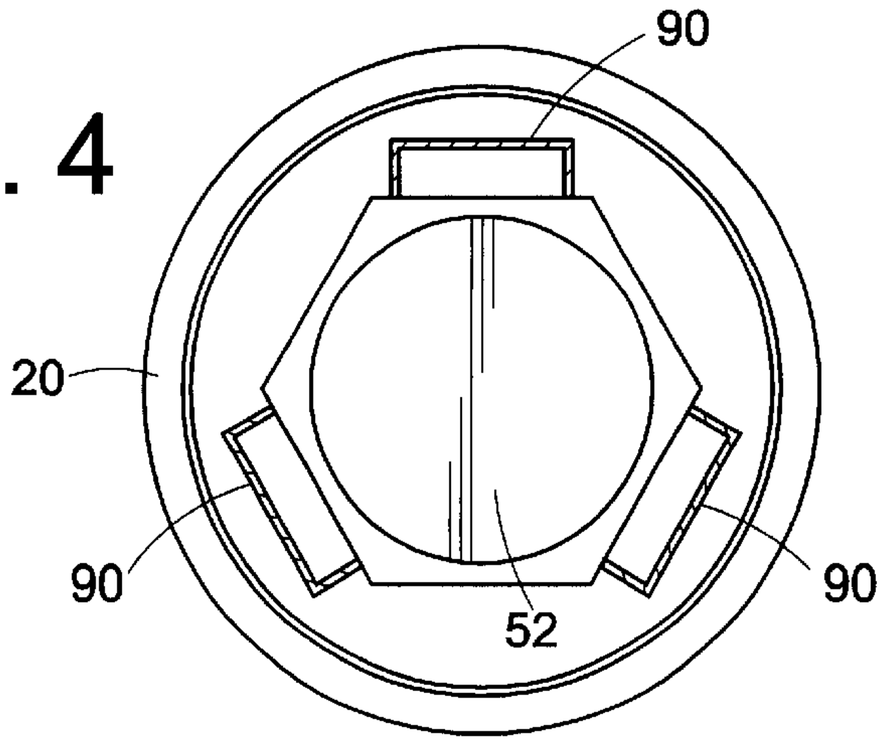
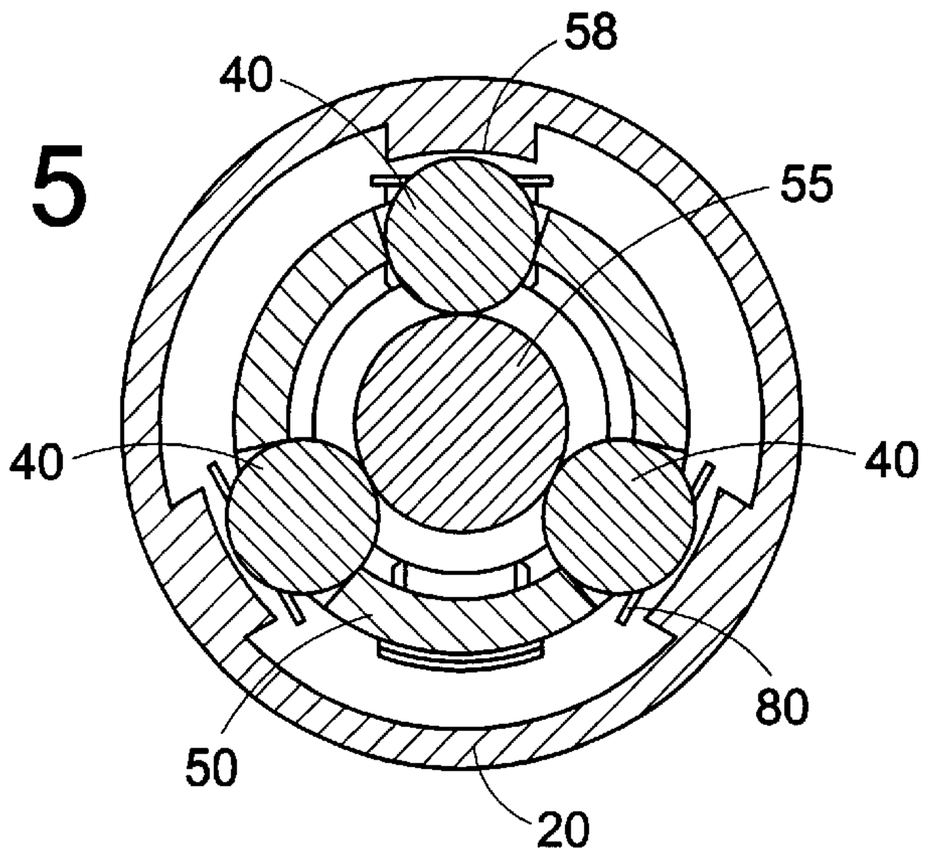


FIG. 5



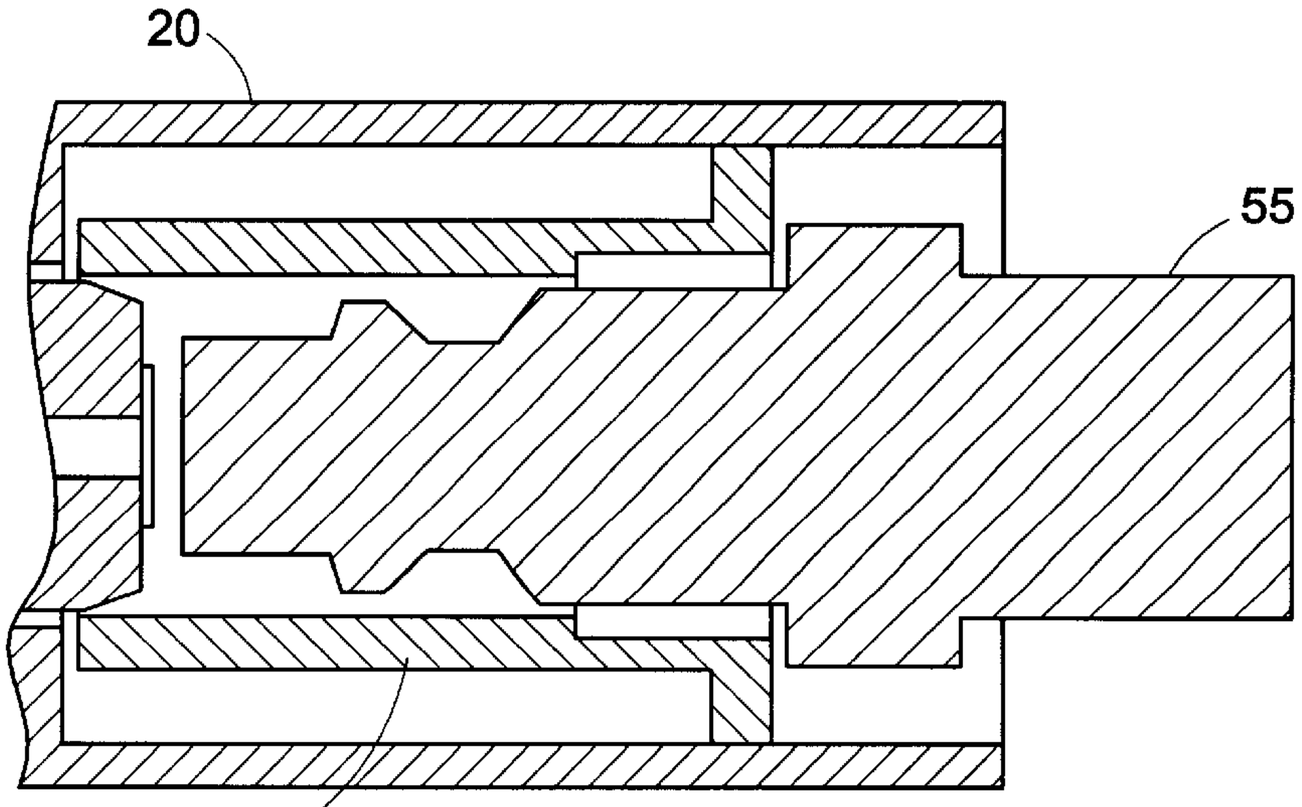


FIG. 6

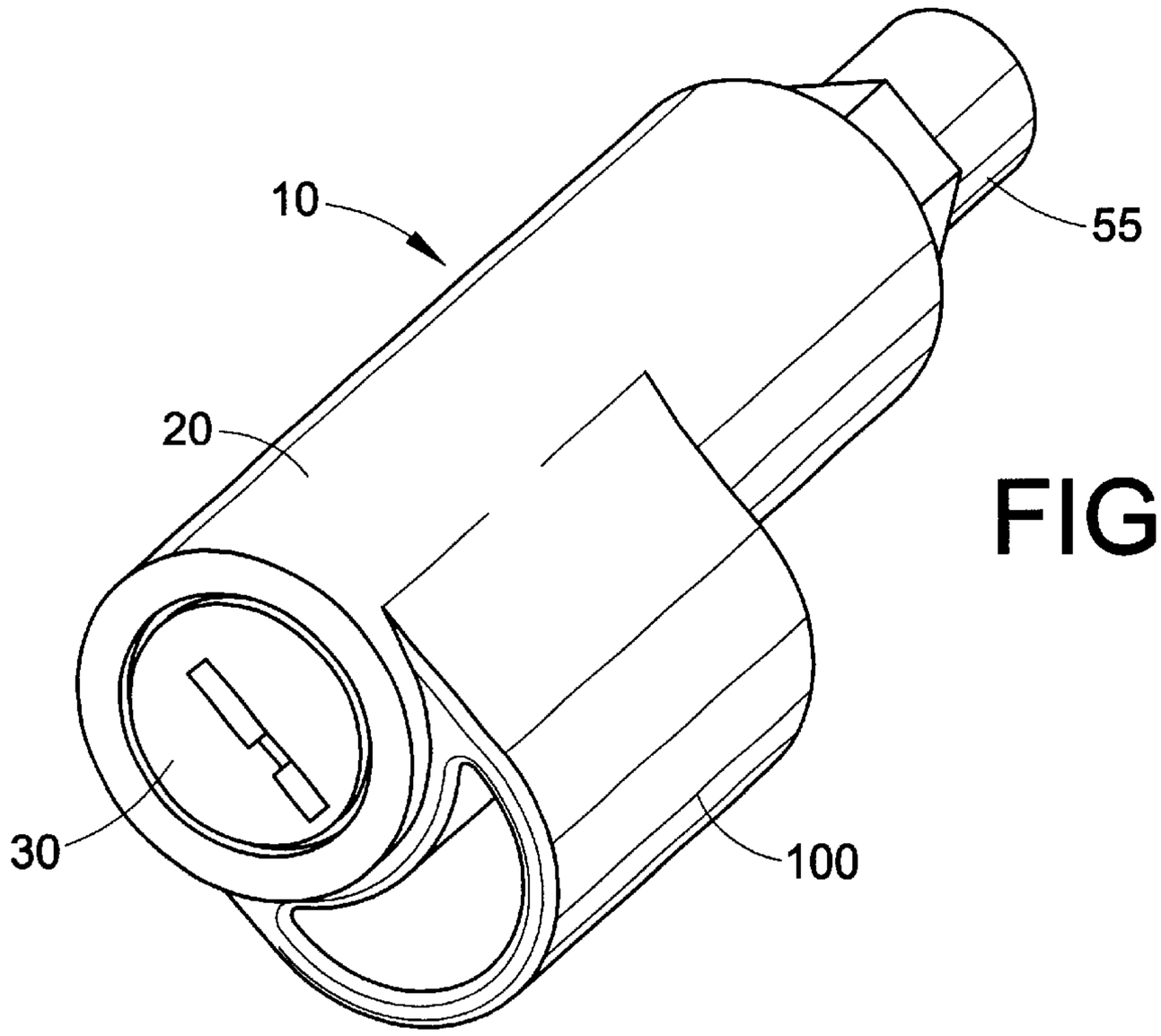
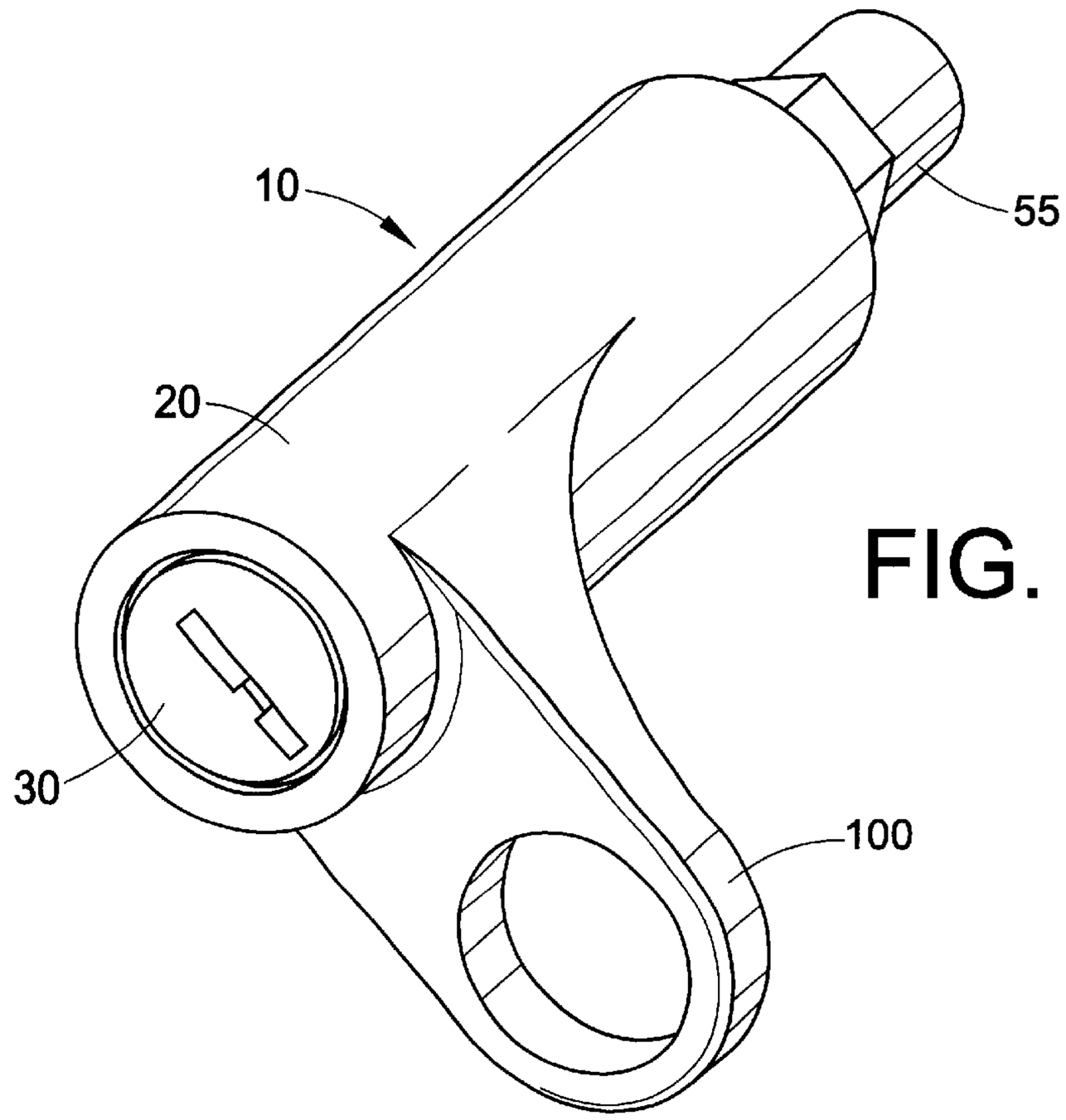


FIG. 7



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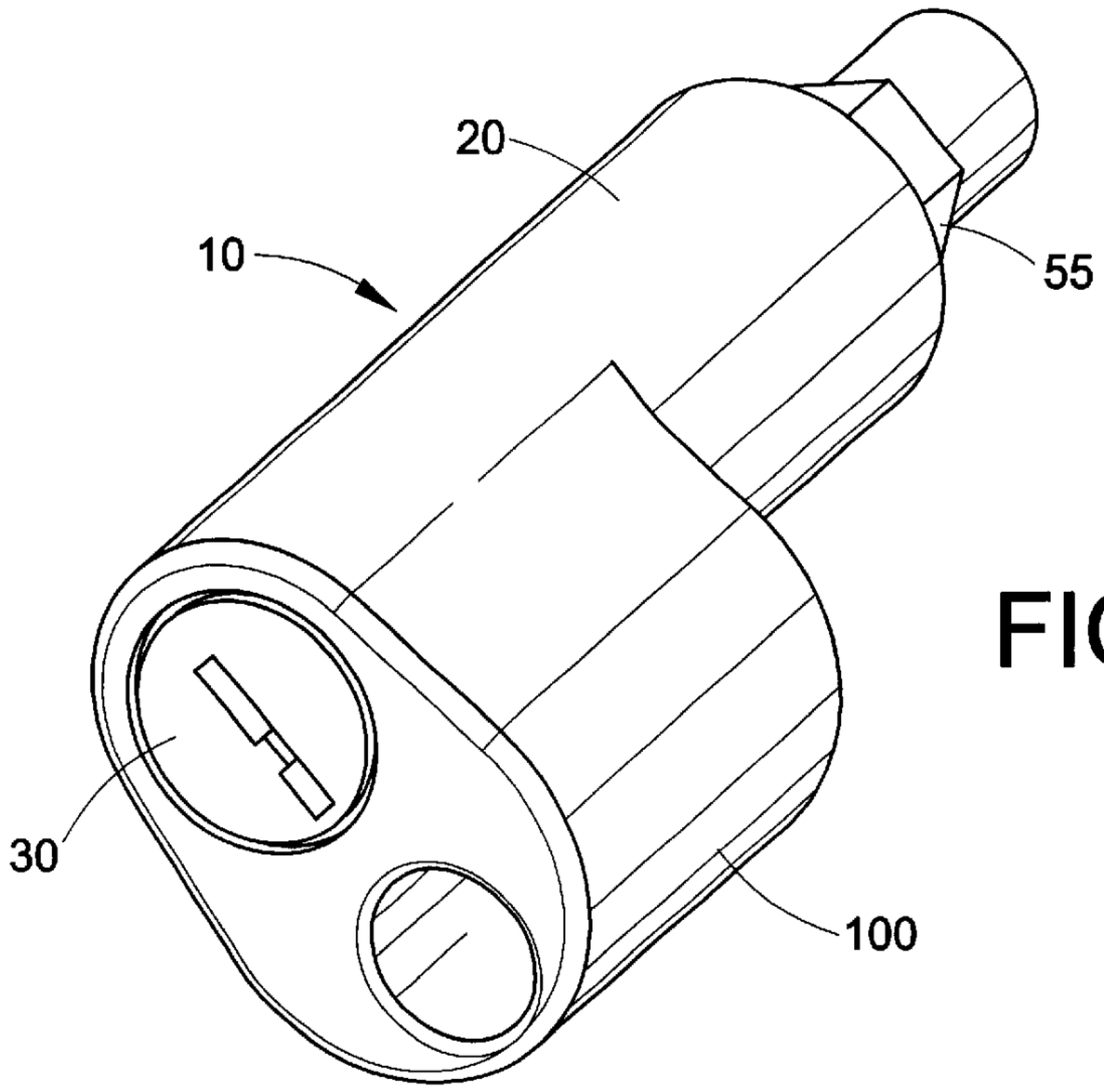

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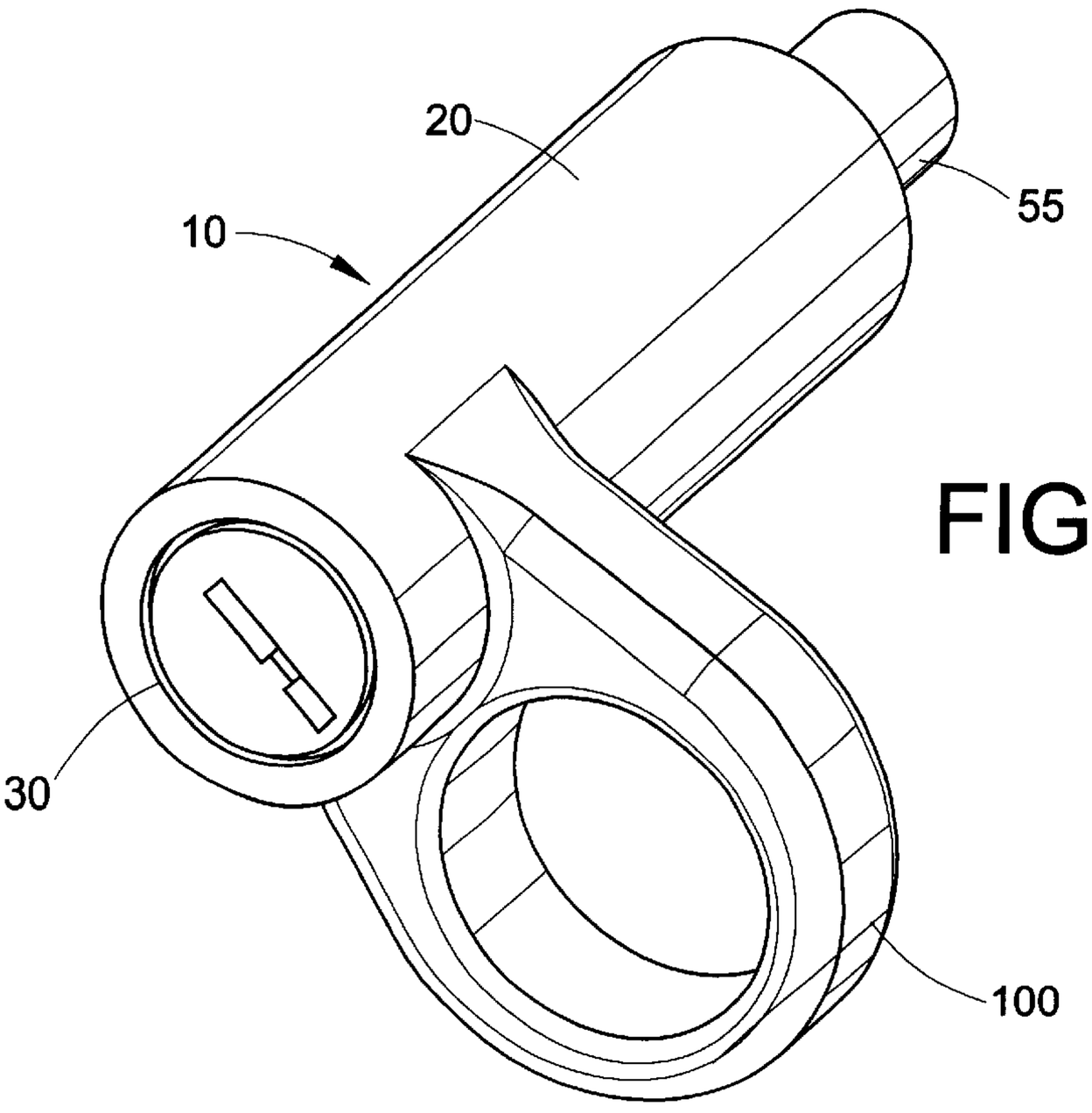

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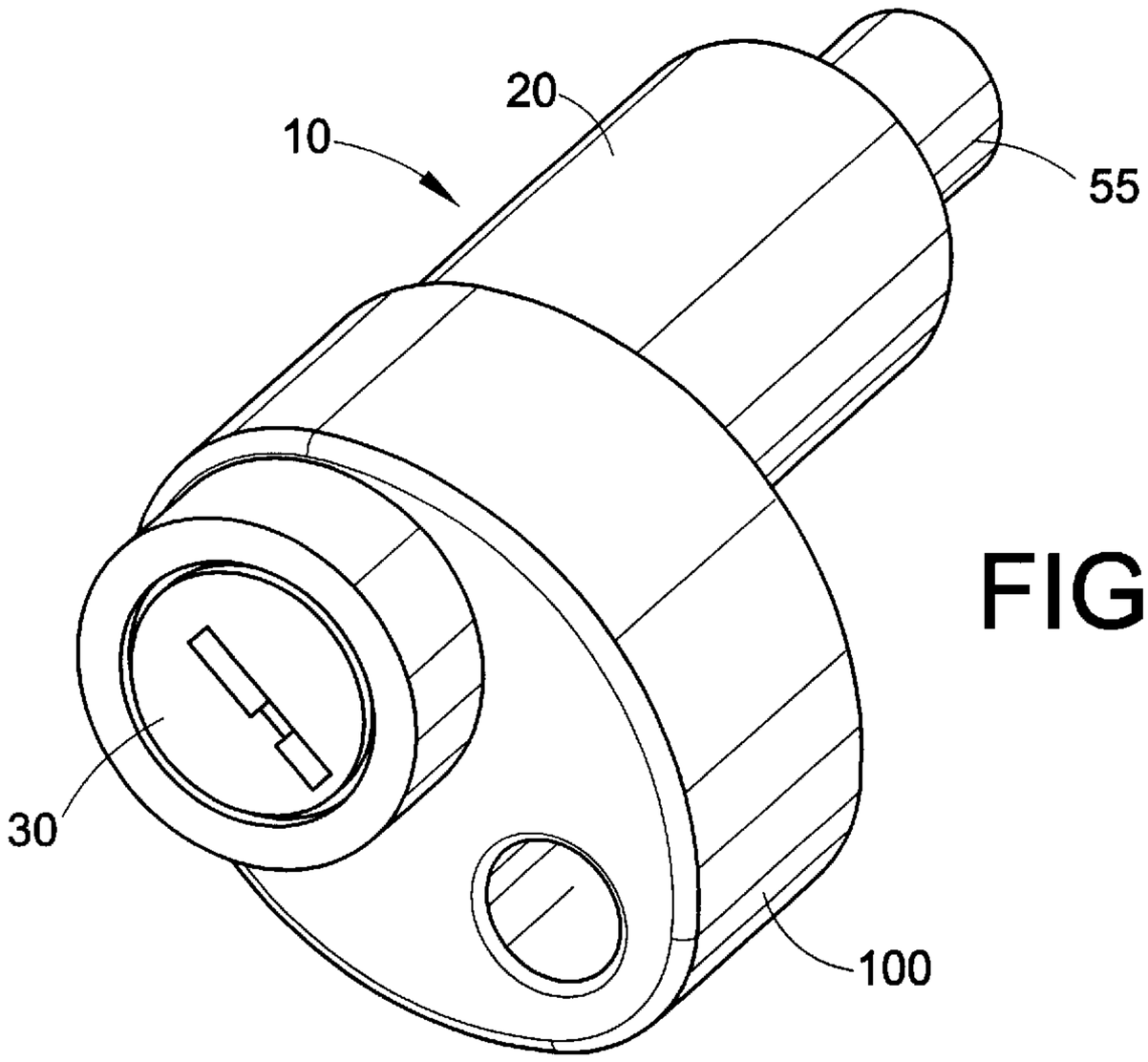

FIG. 11

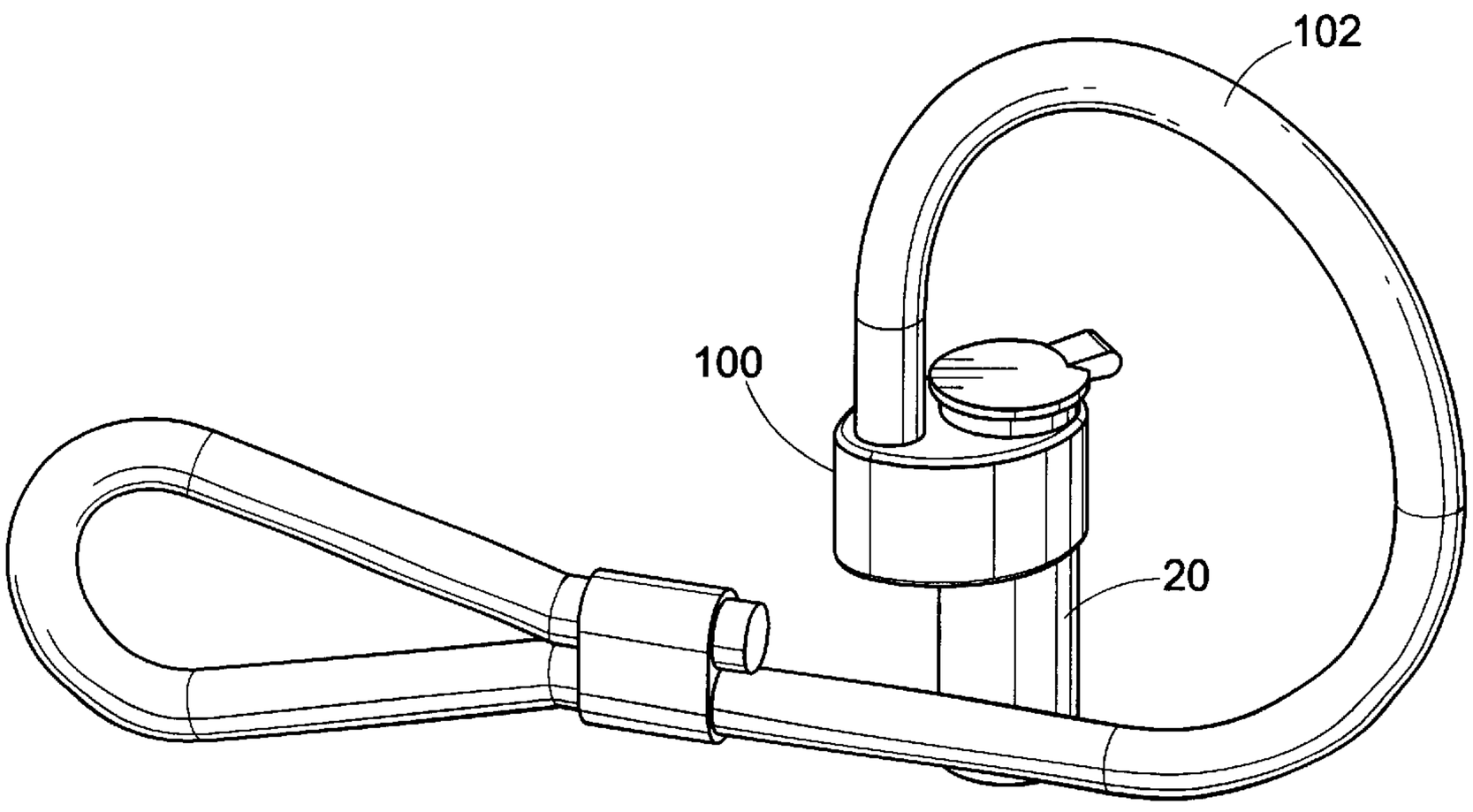

FIG. 12

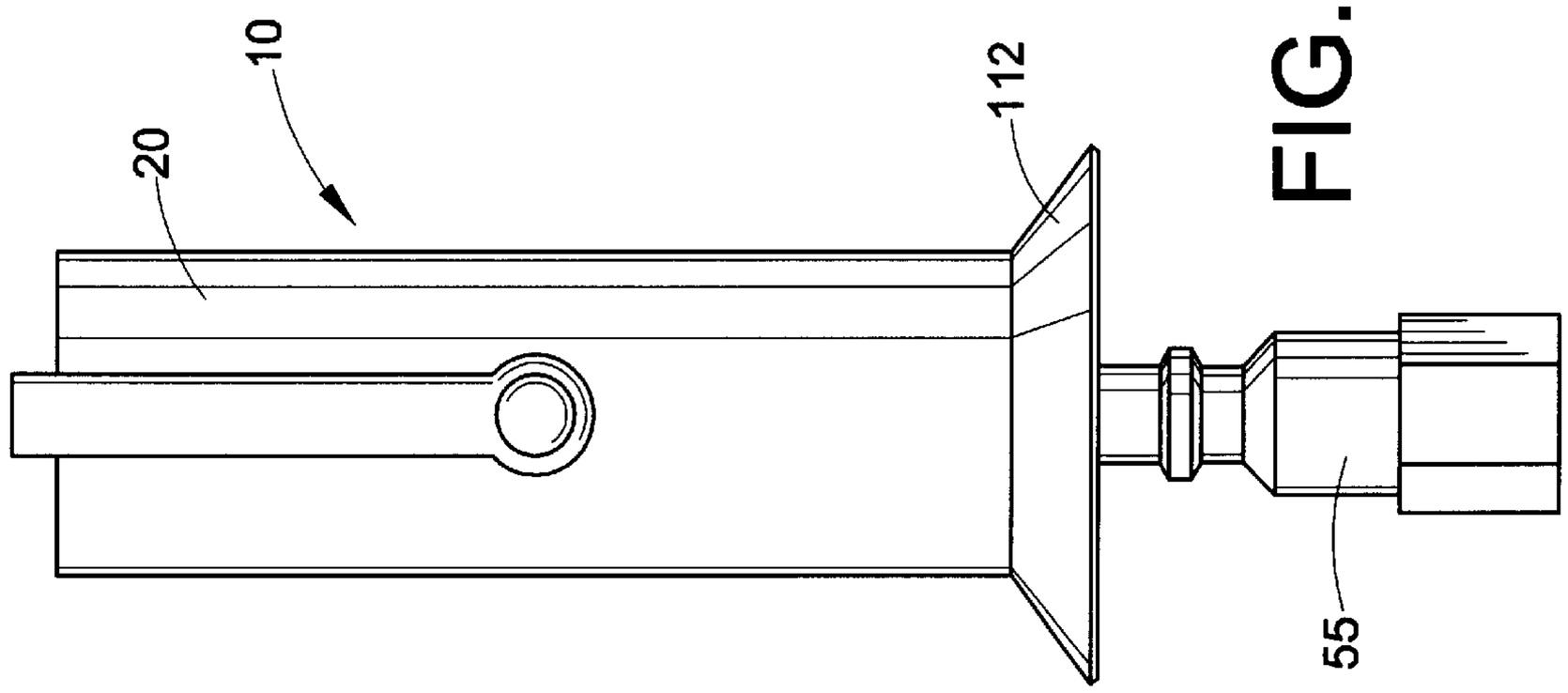

FIG. 14

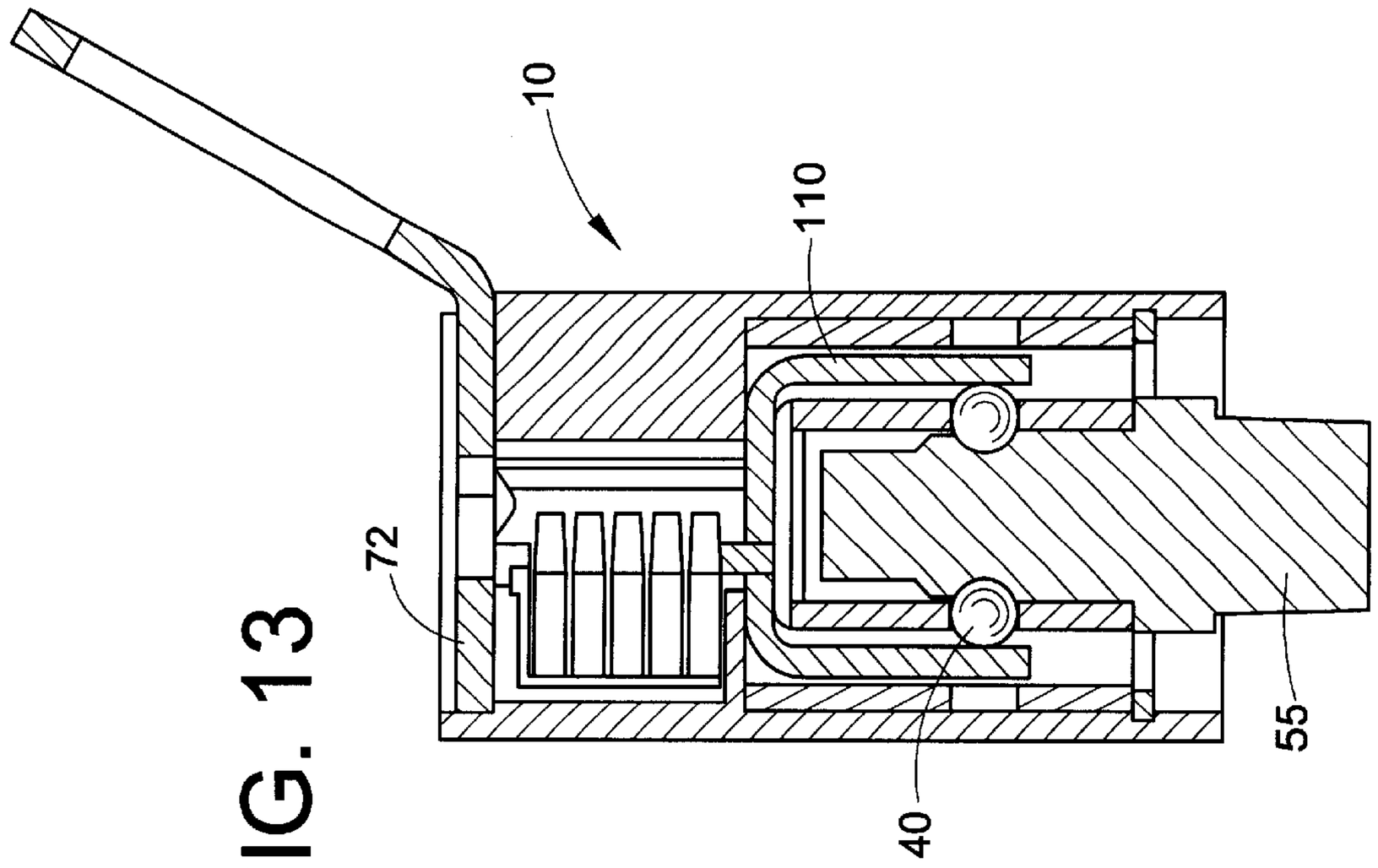

FIG. 13

PNEUMATIC TOOL LOCK

CROSS-REFERENCE TO RELATED APPLICATIONS

This invention claims priority to U.S. Provisional Patent Application Ser. No. 60/304,399, filed Jul. 10, 2001.

FIELD OF THE INVENTION

The invention relates to a lock for tools, and more specifically to a tool lock that engages a pneumatic fitting on a pneumatic tool thereby securing the tool from theft and/or unauthorized use.

BACKGROUND OF THE INVENTION

Pneumatic tools, such as, for example, nail guns, staple guns, impact wrenches, and body grinders are commonly found on contractor sites, in assembly plants, in automotive repair workshops, and in some homes. These tools can be fairly expensive to replace and may be dangerous, especially if used by an unauthorized person, such as a child.

Currently, pneumatic tools are protected from theft or unauthorized use by locking them in safe boxes with a padlock, or using a specially manufactured lock that prevents use of the tool. However, not all tools can be secured in such fashion. In particular, some tools are left out in the open for anyone to take or use simply because a locking mechanism has not been provided. In other circumstances, tools remained unsecured because the locking mechanism provided cannot be adapted to secure the specific tool.

Therefore, it is desirable to provide a lock that can be adapted to fit a wide variety of pneumatic tools and various pneumatic tool fittings. It is further desirable to provide a lock for pneumatic tools that is capable of preventing unauthorized use, theft, or both.

SUMMARY OF THE INVENTION

A lock for securing a pneumatic tool from unauthorized use or theft is provided. In one embodiment, the lock includes a lock housing with a cylinder assembly disposed therein. The lock also includes an inner surface that retains a set of spring-loaded locking balls. The locking balls engage a groove in a pneumatic fitting once inserted into the lock housing. The lock further includes a set of raised surfaces that engage the locking balls when in the locked position and thereby prevent the locking balls from withdrawal from engagement with the pneumatic fitting.

In one embodiment the lock includes a shackle portion which is integral with the lock housing and provides a means for securing the lock to another object. In another embodiment, a cable is included as an integral portion of the shackle.

In another embodiment of the pneumatic tool lock the lock contains an interchangeable cylinder that allows the lock cylinder to be rekeyed.

Another aspect of the present invention provides for a method of securing a pneumatic tool. The method includes locking the pneumatic tool fitting within a lock body. In one embodiment, the method includes securing the lock to another object by placing a cable or padlock through a shackle that is integral with the lock housing.

Still, other advantages and benefits of the present tool lock will be apparent to those skilled in the art upon reading and understanding of the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The tool lock of the present invention may be more readily understood by reference to the following drawings.

While certain embodiments are shown as illustrative examples of the tool lock, the scope of this application should not be construed as limited to these illustrative examples.

FIG. **1** is a perspective view of the pneumatic tool lock of the present application;

FIG. **2** is an end view of the pneumatic tool lock showing the keyway and cylinder assembly;

FIG. **3** is a cross-sectional view taken through A—A and showing the tool lock in the locked position;

FIG. **4** is an end view of the pneumatic tool lock showing the inner housing wherein the pneumatic tool fitting is inserted;

FIG. **5** is a cross-sectional view of the pneumatic tool lock taken through Z—Z;

FIG. **6** is a cross-section view of the pneumatic tool lock taken through C—C;

FIG. **7** is a perspective view of the pneumatic tool lock incorporating the integral shackle feature;

FIG. **8** is a perspective view of another embodiment of the pneumatic tool lock which incorporates the integral shackle feature;

FIG. **9** is a perspective view of another embodiment of the pneumatic tool lock which incorporates the integral shackle feature;

FIG. **10** is a perspective view of another embodiment of the pneumatic tool lock which incorporates the integral shackle feature;

FIG. **11** is a perspective view of another embodiment of the pneumatic tool lock which incorporates the integral shackle feature;

FIG. **12** is a perspective view of a pneumatic tool lock incorporating the integral cable feature;

FIG. **13** is a cross-sectional view of another embodiment of the pneumatic tool lock incorporating a trap door feature and a cylinder extension; and

FIG. **14** is an embodiment of the pneumatic tool lock that incorporates a shield.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is a lock for securing pneumatic tools, generally referenced as **10**. The lock includes lock housing **20**, cylinder assembly **30**, and one or more spring-loaded locking balls **40** located within a locking cavity of the lock housing, three are shown in the embodiment shown in FIG. **5**. The lock housing **20**, generally is cylindrical with an inner housing **50** located therein. In should be appreciated that the lock body may be various shapes, sizes and configuration providing that it provides the same functional aspects as described herein. The lock housing **20** is generally a hardened metal that provides security for the internal components of the lock **10**. The lock housing may be provided wit an external coating of material, such as, for example, rubber or plastic if an external metal surface is not desired. Such an external coating can prevent the lock from scratching other surfaces, such as the surface of the tool to which the look is applied. The cylinder assembly **30** is housed within the lock housing **20** such that keyway **54** is accessible from the end **56** of the lock **10**. The lock housing **20** contains locking ball retention ridges **58** that engage the locking balls **40** and thereby secure them in the locked position, as discussed in greater detail herein below.

The inner housing **50** is disposed within the lock housing **20** at the opposite end **59** of the lock **10** from the cylinder **30**.

The inner housing **50** is generally cylindrical with an opening **52** for receiving a pneumatic fitting **55**. The inner housing **50** also has cutaway portions **60** which house the locking balls **40** which are retained by ball springs **80**. As discussed further below, the locking balls **40** engage the pneumatic fitting **55** of the pneumatic tool (not shown) and secure the fitting **55** within the inner housing **50** of the lock **10**.

The cylinder assembly **30** can be a variety of shapes, sizes, and configurations, and may incorporate a number of different locking mechanisms. In one embodiment, an interchangeable wafer tumbler locking cylinder is employed. The interchangeable wafer locking cylinder may be similar to the invention disclosed in co-pending U.S. patent application Ser. No. 10/187,727, filed on Jul. 2, 2002 entitled PICK RESISTANT WAFER TUMBLER LOCK WITH SIDEBARS, which claims priority to U.S. provisional patent application No. 60/302,643 filed on Jul. 2, 2001 entitled PICK RESISTANT WAFER LOCK WITH SIDEBAR, the entire disclosure of which is hereby incorporated by reference. Other lock cylinders may be used, such as, for example, the rekeyable cylinder assembly shown in FIG. **13** which incorporates a conventional trap door **72** for interchanging the lock cylinder. The trap door **72** includes a trap door screw and a trap door nut that allows for the removal of the cylinder **30**. The rekeyable feature disclosed in the above-referenced patent applications and in the cylinder including the trap door feature is an additional aspect of the present tool lock that would allow the pneumatic tool lock to be rekeyed in the event of theft of the correct key. Further, this feature allows a set of pneumatic tool locks to be keyed the same, thereby allowing a master key to be useable on an entire set of tool locks. This feature can prevent the need for a tool operator to have a different key for each of the different tools in which a tool lock is applied.

The inner housing **50** includes a shoulder (the surface of housing **50** which faces fitting **55** in FIG. **3**) and an inner surface contains cutaway portions **60** that position the locking balls **40** for retention by ball springs **80**. The locking balls **40** are dimensioned to engage the coupling groove **85** in the pneumatic fitting **55**. The ball springs **80** retain and engage the locking balls **40** and provide a spring force that biases the locking balls **40** towards the center of the lock **10** and into engagement with the coupling groove **85** in the pneumatic fitting **55**, when inserted into the inner housing **50** of the lock. In one embodiment, the ball springs **80** are fitted around the inner housing **50** such that centering clips **90** are formed along the interior wall **92** of the inner housing **50**. The centering clips **90** engage the pneumatic fitting **55** as the fitting is slid into the opening **52** of the inner housing **50**. The centering clips **90** are spring-loaded to bias the pneumatic fitting **55** into the center of the inner housing opening **52**, thereby ensuring that each locking ball **40** is secured within the coupling groove **85** of the pneumatic fitting **55**. Furthermore, use of centering clips **90** will stabilize the lock **10** on the fitting **55** and provide for a tighter fit. While the centering clips **90** are generally shown as part of the balls springs **80**, it should be appreciated that the centering clips may be a separate piece from ball springs **80**.

The inner housing **50** is dimensioned to receive one of the several standard sizes of pneumatic fittings **55**. As such, the depth and other dimensions of the inner housing **50** are selected in order to enable operational alignment of the locking balls **40** upon engagement of an appropriately sized pneumatic fitting **55** to correspond to the dimensions of the inner housing **50**. As such, multiple sizes of the lock **10** are contemplated; however the user of the lock may also change the size of the pneumatic fitting **55**, and the mating fitting on the air supply hose of line, to accommodate the lock **10**.

As shown in FIGS. **7–11**, the lock housing **20** may further include a shackle **100** that is integral with the lock housing **20** and provides a means for securing the lock **10** to another object, such as, for example, a workshop bench or table, to prevent theft. As shown in FIGS. **7–11**, the shackle **100** may be formed, in one piece or fixed with the lock housing **20**, in various shapes, sizes and configurations depending on how the lock **10** is to be secured to another object. Alternatively an integral shackle **100** maybe used which is movable with respect to the lock housing **20**. For example, the shackle shown in FIG. **13** is secured to a hinge which allows for the displacement of the shackle **100** with respect to the lock h&sing **20**. In some embodiments, the shackle **100** can be used in conjunction with a padlock, which may be used in conjunction with a separate chain or cable, while in other embodiments the shackle **100** can be used in conjunction with a theft-resistant cable. In the embodiment shown in FIG. **12**, a theft-resistance cable **102** is integral with the lock housing **20** and shackle **100** to provide a means for securing the lock **10** to an object. The cable **102** may take on a variety of sizes, and may provide simple fastening means, an adjustable length, or a separate locking feature, It is further contemplated that a locking feature of the cable **102** may be integral with the lock housing **20** and may further be functionally coupled to the cylinder assembly **30** of the pneumatic tool lock **10**. Bach of these aspects of the present invention are considered apart of the scope of the invention, by themselves or in combination with other aspects of the invention.

To engage the lock **10**, the pneumatic fitting **55** of the pneumatic tool is inserted into the opening **52** of the inner housing **50** of the lock, the centering clips **90** guiding the fitting into proper alignment with the looking balls **40**, As the pneumatic fitting **55** is inserted into the inner housing **50**, the configuration of the surface of the pneumatic fitting **55**, along with the spring force provided by the ball springs **80**, allows the locking balls **40** to move along the surface of the pneumatic fitting **55** and to detent into to retaining groove **85** of the pneumatic fitting **55**. A key (not shown) is inserted into the keyway **54** and rotated, thereby rotating the cylinder assembly **30** into the locked position. The cylinder assembly **30** further rotates the inner housing **50** until the locking balls **40** are aligned with the locking ball retention surfaces **58**. So aligned, the locking balls **40** are secured into engagement with the retention groove **85** as the locking ball retention surfaces **58** prevent the locking balls **40** from retraction from the retention groove **85** into the inner housing **50**. In the locked position, as illustrated in FIG. **3**, the pneumatic tool (not shown but engaged and secured with the pneumatic fitting **55**), is secured from unauthorized use as the lock **10** secures the pneumatic fitting. If so desired, the lock **10** can then be secured to another object by securing the shackle **100** with a padlock, chain, cable or combinations thereof, as described above.

In order to disengage the lock **10**, the key is inserted into the keyway **54** and rotated such as to rotate the cylinder assembly **30** into the unlocked position. In doing so, the inner housing **50** rotates to remove the locking balls **40** from alignment with the locking ball retention surfaces **58**. The locking balls **40** are thus free to retract into the cutaway portions **60** of the inner housing **50**. However, since the locking balls **40** are spring biased towards the center of the lock by bail springs **80**, the locking balls **40** remain in engagement with the retention groove **85** until the pneumatic

fitting **55** is pulled from the inner housing opening **52** of the lock **10**. As the pneumatic fitting **55** is pulled from the inner housing opening **52**, the retention groove **85** provides a camming surface that allows the locking balls **40** to be removed from the retention groove **85** and thereby allows the pneumatic fitting **55** to be removed from the lock **10**.

In other embodiment of the invention, the inner housing **50** also includes a separate cylinder extension **110**, which can rotate between the inner housing **50** and the lock housing **20** and provide the ball retention surfaces in the locked position. As shown in FIG. **14**, the lock **10** may also include a shield **112**, which is affixed at the end **59** of the lock **10** and fits over part of pneumatic tool, or abuts against the surface of the pneumatic tool, thereby preventing access to the screws or bolts that retaining the pneumatic fitting **55**. The shield **112** would thereby prevent bi-passing the fitting **55** and pneumatic tool lock **10** resulting in theft or unauthorized use of the lock.

What is claimed is:

1. A lock for preventing theft or unauthorized use of a tool comprising:

a lock housing;

a lock cylinder assembly disposed within said lock housing;

two or more locking balls disposed within the lock housing;

ball springs that engage the locking balls and bias the locking balls towards the center of the lock housing, wherein said ball springs further comprise centering clips that engage a pneumatic fitting; and

an opening in said look housing, wherein a portion of a tool can be inserted;

wherein said locking balls are retained with respect to the portion of the tool inserted within said opening in said lock housing when the lock cylinder is in a locked position.

2. A lock for preventing theft or unauthorized use of a tool comprising;

a lock housing;

a lock cylinder assembly disposed within said lock housing;

two or more looking balls disposed within the look housing;

a pneumatic tool fitting, wherein said pneumatic tool fitting is secured to said tool; and

an opening in said lock housing, wherein said pneumatic tool fitting is secured;

wherein said locking balls are positioned to engage the pneumatic tool fitting in a locked position and are positioned to disengage the pneumatic tool fitting in an unlocked position.

3. The lock of claim **2**, wherein said lock cylinder assembly is a wafer tumbler cylinder assembly incorporating pick-resistance features.

4. The lock of claim **2**, wherein the lock housing further comprises locking ball retention projections, wherein said projections engage the locking balls when in a locked position.

5. The lock of claim **2**, wherein the lock housing further comprises a shackle for securing the lock to another object.

6. The lock of claim **2** further comprising an integral cable for securing the lock to another object.

7. The lock of claim **2**, further comprising a shield that is affixed to a pneumatic tool fitting receiving end of the lock, wherein said shield abuts the tool and prevents access to the portion of the tool secured by said lock.

8. The lock of claim **2**, wherein the cylinder assembly is interchangeable.

9. The lock of claim **8**, wherein the cylinder assembly includes a trap door mechanism for removing said lock cylinder from the lock housing.

10. A lock for preventing theft or unauthorized use of a tool comprising:

a lock housing;

a lock cylinder assembly disposed within said lock housing;

two or more locking balls disposed within the lock housing;

two or more looking ball retention surfaces;

an inner housing with two or more cutaway portions;

an opening in said lock housing, wherein a portion of a tool can be inserted; and

ball springs that engage the locking balls and bias the locking balls towards the center of the lock housing

wherein said inner housing is rotated between

i) a locked position wherein said locking balls are engaged by said locking ball retention surfaces and are secured into engagement with said portion of said tool inserted into said lock housing opening; and

ii) an unlocked position wherein said locking balls are disengaged from said locking bail retention surfaces and can be removed from engagement with said portion of said tool inserted into said lock housing opening.

11. A lock comprising:

a lock housing including a locking cavity therein, wherein said locking cavity includes an internal housing comprising a shoulder for mating engagement with a pneumatic fitting when in a locked position;

a rotatable lock cylinder disposed within said lock housing;

two or more locking balls disposed within the locking cavity of said lock housing a means for selectively retaining said locking balls in interlocking engagement with a tool, wherein said means for selectively retaining said locking balls includes;

an inner surface that houses said locking balls within a set of openings;

ball springs that engage said locking balls and bias the locking balls toward the center of the locking cavity; and

locking ball retention surfaces that engage said locking balls when said lock is in the locked position and prevent said locking balls from withdrawing from engagement with said tool.

* * * * *